A Sustainability Perspective on AI-based Education and Digital Transformation under NEP 2020

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ABSTRACT This study attempts to understand the impact of National Education Policy (NEP) 2020 of India on the fishing communities of coastal West Bengal. The community is a marginalized group marked by low literacy, unstable income, and poor healthcare access. The study assumes NEP 2020 as a catalyst for social, economic, and individual sustainability. This can be achieved through digital transformation and Artificial Intelligence (AI) enabled education. Primary data were collected from 150 respondents. A structured questionnaire across two coastal districts in West Bengal, India. The findings indicated statistically significant associations between NEP 2020 with the three dimensions of sustainability. These are aligned with the Sustainable Development Goals (SDGs) particularly SDG 4 and SDG 10. The SDGs advocate for access to quality education and equality. The findings also highlight that AI-based digital education can enhance equitable access for marginalized populations. In this connection, NEP 2020 can be a base to improve the conditions of marginalized communities.

Keywords: NEP 2020, Digital Transformation, AI, SDGs, Marginalized Communities, West Bengal, India.

1. Introduction

The fishing communities in India have remained marginalized for a long time. They have remained outside mainstream social and economic participation. They have low education levels, unstable incomes and limited access to healthcare. These conditions create multiple disadvantages and long term poverty [1]. Fishing communities in coastal West Bengal live in regions with poor communication infrastructure. This further limits their access to educational opportunities [2]. India's National Education Policy (NEP) 2020 offers a transformative framework for universal, accessible, and quality education. It gives special attention to underprivileged groups [3]. The policy has a vision that connects with digital transformation and the use of Artificial Intelligence (AI) in teaching and learning [4]. At the same time, sustainability principles now include digital transformation and AI as drivers of inclusive development. The Fourth Industrial Revolution has introduced AI based adaptive learning platforms, mobile connectivity, and data driven policies. These tools help to reach communities that were earlier excluded from educational systems [5]. The United Nations Sustainable Development Goals (SDGs) provide a framework for assessing progress in this direction. In specific terms, SDG 4 focuses on quality education and SDG 10 focuses on reducing inequalities [6]. This paper examines NEP 2020 through the lens of social, economic, and individual sustainability. The study focuses on fishing communities in coastal West Bengal. The study is also grounded in AI supported and digitally enabled education systems.

2. Review of literature

NEP 2020 is seen as the most comprehensive educational reform in India in a long time [7]. The policy gives emphasis to universal access, development of vocational skills, and multidisciplinary higher education. This aligns with SDG 4 that advocates inclusive quality education [8]. NEP 2020 incorporates the principles of both human rights as well as sustainable development [9]. It has the capacity to transform India's educational infrastructure in line with modern times [10]. NEP 2020 gives special attention to vocational education for marginalized communities. Traditionally, in India social status has been associated with skills-based occupations [11]. It is well acknowledged that NEP 2020 strongly emphasizes sustainable development. Fishing communities of India often face structural disadvantages when it comes to education, healthcare, and income [12]. They face several socioeconomic challenges in the form of seasonal income instability and limited access to government welfare schemes [13]. Digital exclusion also results in lack of connectivity infrastructure and support systems. As a result, AI educational tools remain underutilized in these communities. The Fourth Industrial Revolution has accelerated the use of AI in education globally [5]. Personalized learning is well supported by adaptive learning systems. Natural language processing tools enhance the understanding of subject matter. AI enabled assessment platforms help in the effective evaluation of learners. These technologies benefit learners irrespective of their locations and educational backgrounds. The United Nations has emphasized that AI must follow the principles of human rights, inclusion, and transparency in line with SDG 4 [14]. NEP 2020 aligns with AI-based education to achieve educational equity based on SDG 10. It is especially relevant for marginalized communities that form the core focus of the study.

3. Research Objective

The primary objective of the study is to understand the relation of NEP 2020 with social, economic, and individual dimensions of sustainability in the context of fishing communities in West Bengal.

4. Research Hypotheses

Hypothesis H_1: NEP 2020 and the Social Sustainability have a significant association between them.
Hypothesis H_2: NEP 2020 and Economic Sustainability have a significant association between them.
Hypothesis H_3: NEP 2020 and the Individual Sustainability have a significant association between them.

5. Research Methodology

The study was conducted in the two coastal districts of Purba Medinipur and South 24 Parganas in the Indian state of West Bengal. Data was collected from 150 respondents of fishing communities through a purposive sampling method. A structured questionnaire was used to capture demographic details in terms of age, income, education, and healthcare access. It also evaluated the perceptions of NEP 2020 across social, economic, and individual dimensions using a five-point Likert Scale. Descriptive statistics, Chi square tests of independence, and Cramér's V were applied for data analysis using SPSS. The research design follows a sustainability framework and considers NEP 2020 as a digital era policy variable.

6. Results and Discussion

6.1 Demographic Profile

The majority of the participants are in the working age group, with nearly 80 percent between the age of 31 and 50 years. A majority 66 percent have education below secondary level. About 62 percent earn below ₹20,000 per month. This is consistent with the previously documented vulnerabilities in coastal fishing communities [13]. Poor healthcare access affects 64 percent of respondents. This reflects the disadvantages of the marginalized coastal populations [1]. These findings highlight the economic, educational, and health vulnerabilities of coastal fishing communities.

6.2 Reliability

The Cronbach's Alpha value of 0.88 for four categorical variables (NEP, Social, Economic, Individual) exceeds the threshold of 0.90. This indicates appropriate internal consistency [15]. In other words, the instrument is confirmed suitable for inferential analysis.

6.3 NEP 2020 and Social Sustainability

A Chi-square test of independence was conducted to examine the relationship between the implementation of NEP 2020 and social sustainability. The results indicated a statistically significant association between the two variables, $\chi^2(4, N = 150) = 203.71$, $p < 0.001$. The likelihood ratio test further supported this finding, $\chi^2(4) = 218.98$, $p < 0.001$. Moreover, the linear-by-linear association was also found to be significant, $\chi^2(1) = 90.09$, $p < 0.001$. It suggests a consistent trend in the relationship. The measures of association revealed a very strong relationship between NEP 2020 and social sustainability with Cramér's V = 0.824 ($p < 0.001$). Therefore, Hypothesis H_1 is supported.

6.4 NEP 2020 and Economic Sustainability

Again, a Chi-square test of independence was performed to understand the association between NEP 2020 implementation and economic sustainability. The results indicated a statistically significant association, $\chi^2(4, N = 150) = 210.98$, $p < 0.001$. Moreover, Cramér's V was also calculated to determine the strength of this association. The Cramér's V = 0.839 ($p < 0.001$) represented a very strong effect size. It suggests a robust connection between the educational reforms outlined in NEP 2020 and respondents' perceived economic sustainability. Thus, Hypothesis H_2 is also accepted.

6.5 NEP 2020 and Individual Sustainability

To evaluate the relationship between NEP 2020 implementation and individual sustainability, Chi-square test of independence was performed. The results revealed a statistically significant association, $\chi^2(4, N = 150) = 265.32$, $p < 0.001$. The Cramér's V = 0.940 ($p < 0.001$) also indicated a strong association. This value is highest observed in all three tested hypotheses. This suggests that the impact of NEP 2020 is most prominent at the individual level. Therefore, Hypothesis H_3 is accepted based on the statistical outcomes.

7. Digital Transformation, AI, and SDGs

The results have deeper meaning from the lens of digital transformation and AI sustainability. It identifies three sustainable alignments. A strong link exists between NEP 2020 and social sustainability which reflects a high demand for fair educational access in coastal areas. AI platforms can deliver content in Bengali and local dialects. These tools extend the reach of NEP 2020 to remote fishing communities. These targeted interventions directly promote inclusive and

high-quality education [6]. This supports principles of access to quality education under SDG 4. Economic sustainability also shows a high correlation which suggests that education policy is a notable tool for economic inclusion. Digital transformation can modernize NEP 2020 delivery. Mobile-first learning and AI-driven vocational training can teach skills required for sustainable fishing. Digital aquaculture tools also create new jobs for coastal youth [5, 11]. These efforts can definitely lead to reducing inequality in the region and aligning with SDG 10 simultaneously. AI-based education does not provide a technical solution alone. Rather these can also be sustainable in terms of equity [14]. AI helps in matching skills with the prospective careers for the members of fishing communities. It also supports digital literacy programs outlined by NEP 2020. However, sustainable AI must also be co-designed with the members of the target community. This will go a long way to ensure relevance to culture and mitigate the chances of algorithmic bias.

8. Conclusion

This study confirmed that NEP 2020 is strongly linked to sustainability. It is specifically in terms of social, economic and individual sustainability. The focus of the study is on marginalized fishing communities in coastal West Bengal. The three hypotheses are supported with statistically significant results. It indicates a strong link between NEP policy and sustainability. The findings also align with the SDG framework. NEP 2020 supports SDG 4 and SDG 10. These advocate access to universal and equitable quality education. Moreover, digital transformation of education is equally important. AI-enabled educational tools can strengthen the impact of NEP because they can easily reach remote and marginalized communities. This can help in overcoming geographic and social barriers of education. However, to make this possible, there is a need for strong collaboration. Policymakers and technology developers must join with community stakeholders. AI-based strategies should be designed in a way to support NEP 2020 through equitable and inclusive education systems. These systems must be adaptive as well as accessible digitally. There is also a need for future research to identify specific AI tools. This can only be ascertained after examining the existing digital infrastructure. These initiatives have the potential to strengthen policy, technology, and sustainability.

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